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Biogeosciences Discussions

Interactive comment on "CO_2 radiative forcing during the Holocene Thermal Maximum revealed by stomatal frequency of Iberian oak leaves" *by* I. García-Amorena et al.

Anonymous Referee #2

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This paper uses the analyses of plant leaf stomata frequencies for reconstructing Holocene atmospheric CO2 concentration trends and ends up with results which deviate significantly from the corresponding records obtained from the Antarctic ice cores, both in terms of absolute concentration values and their Holocene trend, particularly during the late Holocene.

Given the topic of the paper and the nature of the results, this is a potentially very exciting contribution. However, the difficulty with the current paper is that the results are based on a too low number of observations. The main argument of the paper is that the results of the stomata-based CO2 reconstructions deviate from the ice core

records especially during the mid- and late Holocene, from 5000 to 1100 cal yr BP. This argument is based on a reconstructed CO2 concentration curve which is based on two reconstructed values dating to about 4000 cal yr BP and one value dating to about 1100 cal yr BP. This is simply not enough to argue much about the CO2 trends during the mid- to late Holocene. Similarly, the reconstruction of the early-Holocene rising CO2 trend is based on two reconstructed values dating to about 9300 cal yr BP and one value dating to about 7500 cal yr BP.

Related to this, I disagree with the authors that their data would show continuously increasing CO2 from 9000 cal yr BP to 5000 cal yr BP, as argued on page 3955. The curve may show increase during the early Holocene, but starts to decline already at about 6000 cal yr BP (this is , as a matter of fact, what the authors say on page 3952). On page 3952 the authors say that the early-Holocene part of their record is consistent with the ice cores, suggesting “low CO2 levels around 8000 cal BP…” This argument is not supported by the present data because there are no stomata-based CO2 reconstructions that would date to 8000 cal BP or near it. The too low time resolution undermines therefore the main arguments of the paper.

There is a sudden inferred increase of CO2 at about 4000 cal yr BP – what could be the possible explanation for this?

Another point that would require more investigation is the accuracy of the stomata-based reconstructions of CO2 concentration values. The mean reconstructed value for the record is 320 ppmv, which is abnormally high if compared to the ice core data. The authors state that this is a so far unexplained feature common to all reconstructions based on stomatal frequency. Thus, the obvious conclusion is that the factors behind this pattern should be explored more, given the far-reaching implications regarding the accuracy of the ice core CO2 records and the role of humans in the recent rise of CO2 concentration.

Note that you should not use symmetrical ś errors for the calibrated radiocarbon dates

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(Table 1).

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